Google LLC
25 Massachusetts Avenue NW
Ninth Floor
Washington, DC 20001

202-346-1100 main
google.com

October 16, 2017

***Via Electronic Filing***

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street SW
Washington, DC 20554

**Re:** ***Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band (GN Docket No. 12-354); Petitions for Rulemaking Regarding the Citizens Broadband Radio Service (RM-11788, RM-11789)***

Dear Ms. Dortch:

On October 16, 2017, Caitlin Mori and I, representing Google LLC, and Andrew Clegg, representing Alphabet Access, met with Louis Peraertz, Senior Legal Advisor to Commissioner Clyburn. During the meeting, we discussed the points summarized in the attached presentation regarding the rulemaking petitions of CTIA and T-Mobile in the above-captioned dockets.

Pursuant to the Commission's rules, this notice is being filed in the above-referenced dockets for inclusion in the public record. Please contact me should you have any questions.

Respectfully submitted,

Austin C. Schlick
*Director, Communications Law*
*Google LLC*

cc: *Via electronic mail*
Louis Peraertz

# Preserving Opportunity in the CBRS Band

October 16,  2017

Google / Alphabet Access

# Part 96 Already Is Supporting Diverse Innovation and Investment that Should Not Be Disrupted

# Industry is implementing Part 96

- **WInnForum's Spectrum Sharing Committee (45 members)** has released technology-neutral protocols regarding operations, interoperability, security, and device testing/certification, e.g.:
  - SAS-SAS Technical Protocol Specification (2016)
  - Requirements for Commercial Operation in the U.S. 3550–3700 MHz CBRS Band (2017)
- **CBRS Alliance (66 members)** promotes TD-LTE commercial use of the band by different categories of operators
  - LTE-based CBRS technology and relevant capabilities, e.g. multi-operator deployments
  - Product certification program for LTE equipment that ensures multi-vendor interoperability
- **WISPA (800+ members)** is coordinating with WInnForum and leading rural deployment efforts



*See* Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 5-7 (filed July 24, 2017); Comments of the Wireless Internet Service Providers Association, GN Dkt. 12-354, et al., at 10-11 (filed July 24, 2017).

# CBRS is attracting significant, diverse investment

**200+ experimental authorizations** have been granted for the 3.5 GHz band since the 2015 Order

Both traditional & non-traditional use cases are being developed

- **AT&T**, **Verizon**, and **Charter** are testing CBRS 5G systems
- **WISPs** are buying 3.5 GHz equipment to provide rural services under PAL licenses
- **Qualcomm** released Snapdragon X20 LTE modem with 1.2 Gbps speeds at 3.5 GHz
- **GE**, **Nokia** and **Qualcomm** are developing a private CBRS/LTE network for IoT
- **Nokia**'s "Flexizone" small-cell LTE product targets enterprises, venues, and the hospitality industry
- Demonstrations of CBRS streaming 360-degree VR in-car race experience




*See* Comments of Charter Communications, Inc., GN Dkt. 12-354, et al., at 2 (filed July 24, 2017); Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 7-10 (July 24, 2017); Reply Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 4-6 (filed Aug. 8, 2017); Comments of NCTA – The Internet & Television Association, GN Dkt. 12-354, et al., at 5 (filed July 24, 2017); Petition for Rulemaking of CTIA, GN Dkt. 12-354 at 4 (filed June 16, 2017); Qualcomm, *Qualcomm Extends Connectivity Leadership with Second Generation Gigabit LTE Modem* (Feb. 21, 2017), https://www.qualcomm.com/news/releases/2017/02/21/qualcomm-extends-connectivity-leadership-second-generation-gigabit-lte.

# Alphabet Access and Google are doing our part

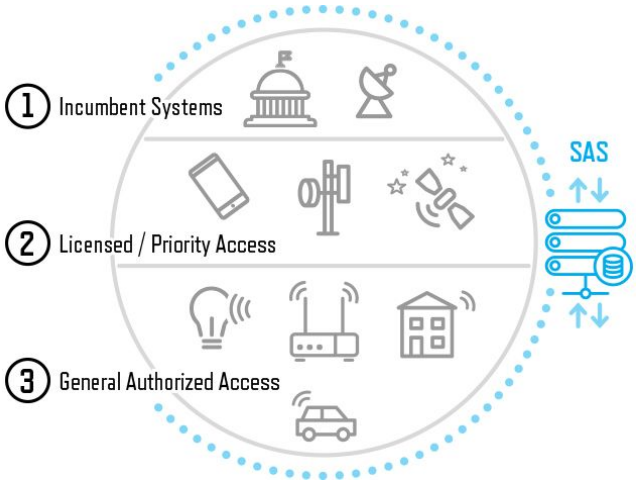
- Collaborative thought leadership:  WInnForum / CBRS Alliance
- Testing and development of CBRS technology
  - Extensive 3.5 GHz propagation testing
  - First end-to-end demonstrations of CBRS mobile devices
    - Partnered to live stream VR from race cars
    - Running 300 Mbps backhaul LTE network for Wi-Fi-equipped employee shuttles between San Francisco and Silicon Valley
  - Demonstrated interoperability with Federated Wireless SAS, validating the SAS-to-SAS interface protocol defined by WInnForum
  - Created the Trusted Tester CBSD Program to help hardware manufacturers test products with Alphabet's SAS; Ericsson was first manufacturer to pass

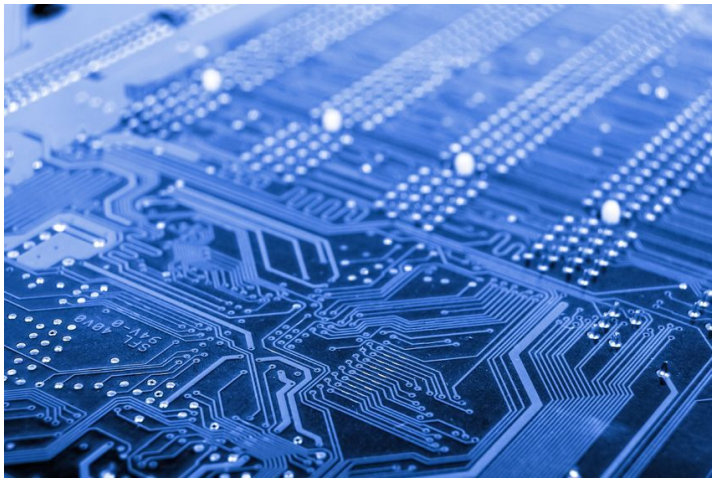


*See* Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 4 (filed July 24,  2017); Dan Meyer, *Alphabet, Federated Claim SAS Interoperability for 3.5 GHz Destined for 5G*, RCR Wireless News (Dec. 21, 2016), https://www.rcrwireless.com/20161221/policy/alphabet-federated-claim-sas-interoperability-for-3-5-ghz-band-destined-for-5g-tag2; Monica Alleven, *Google-led SAS Ready to Test with 3.5 GHz Hardware Vendors for CBRS Band*, FierceWireless (Feb. 24, 2017), http://www.fiercewireless.com/tech/google-led-sas-ready-to-test-3-5-ghz-hardware-vendors-for-cbrs-band.

# Rule changes must not delay upcoming deployments

- WinnForum anticipates the Commission will be able to move forward with the certification of SAS and ESC systems this fall, paving the way for GAA deployments and PAL auctions in 2018
- The first 3.5 GHz LTE handset is expected to be approved later this year





See Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 7 (filed July 24, 2017); SpiderCloud Wireless, *SpiderCloud Wireless Announces Industry's First Dual-Mode CBRS System* (Oct. 11, 2016), http://www.spidercloud.com/news/press-release/spidercloud-wireless-announces-industry%E2%80%99s-first-dual-mode-cbrs-system.

# The Petitions Threaten Economic Opportunity and Spectrum Value

# 5G advances will be heterogeneous, not homogeneous

**New users/ deployers**

- Medicine, agriculture, transportation, manufacturing, entertainment, hospitality and other industries
- Urban, suburban, rural

**New tech**

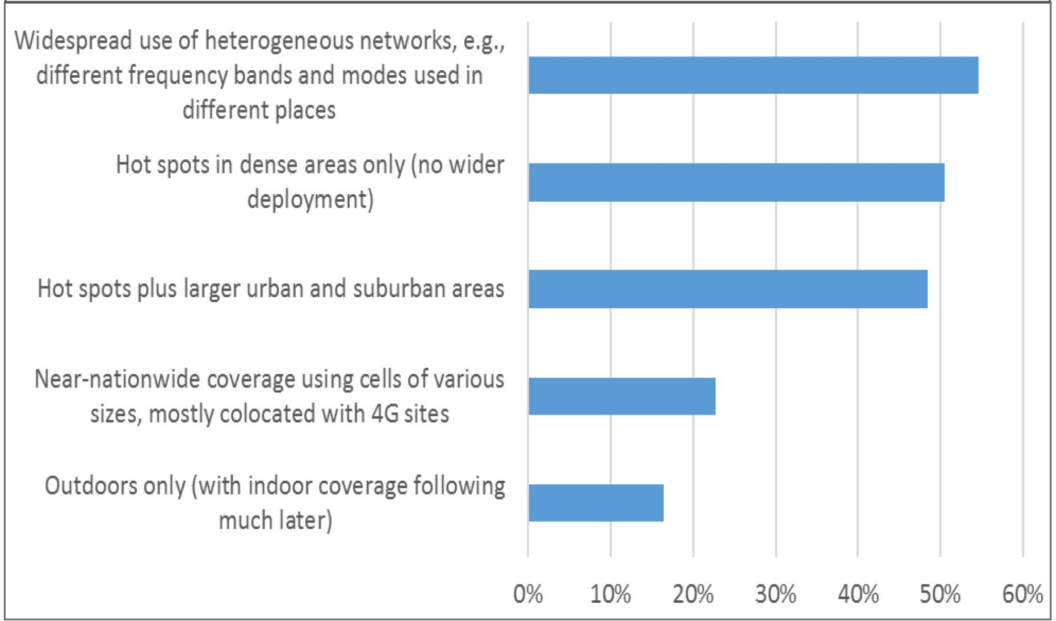
- IoT (wearables, fitness devices, self-driving cars, smart grids, home and office automation)
- VR and AR
- Smart cities
- Telemedicine

**Macrocell / small-cell**

- 5G will require both wide-area and "hot spot" deployments

Huawei Survey of Global Mobile Suppliers Association (2015)

*Thinking about deployment models for 5G networks, which do you think will be most prevalent for an operator in its first couple of years of commercial 5G operation?*






*See* 4G Americas, *5G Technology Evolution Recommendations*, at 2-8 (Oct. 2015), http://www.5gamericas.org/files/2414/4431/9312/4G_Americas_5G_Technology_Evolution_Recommendations_-_10.5.15_2.pdf; Global mobile Suppliers Association, *The Road to 5G Drivers, Applications, Requirements and Technical Development*, at 28 (Nov. 2015), http://www.huawei.com/minisite/5g/img/GSA_the_Road_to_5G.pdf; *In the Matter of Use of Spectrum Bands Above 24 GHz Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014, ¶¶ 7, 261 (2016).

# US incumbencies require different rules than elsewhere

- Incumbency issues in the US 3.5 GHz band are with the military, and are dynamic
- Infeasible to harmonize CBRS with rules in other countries or regions

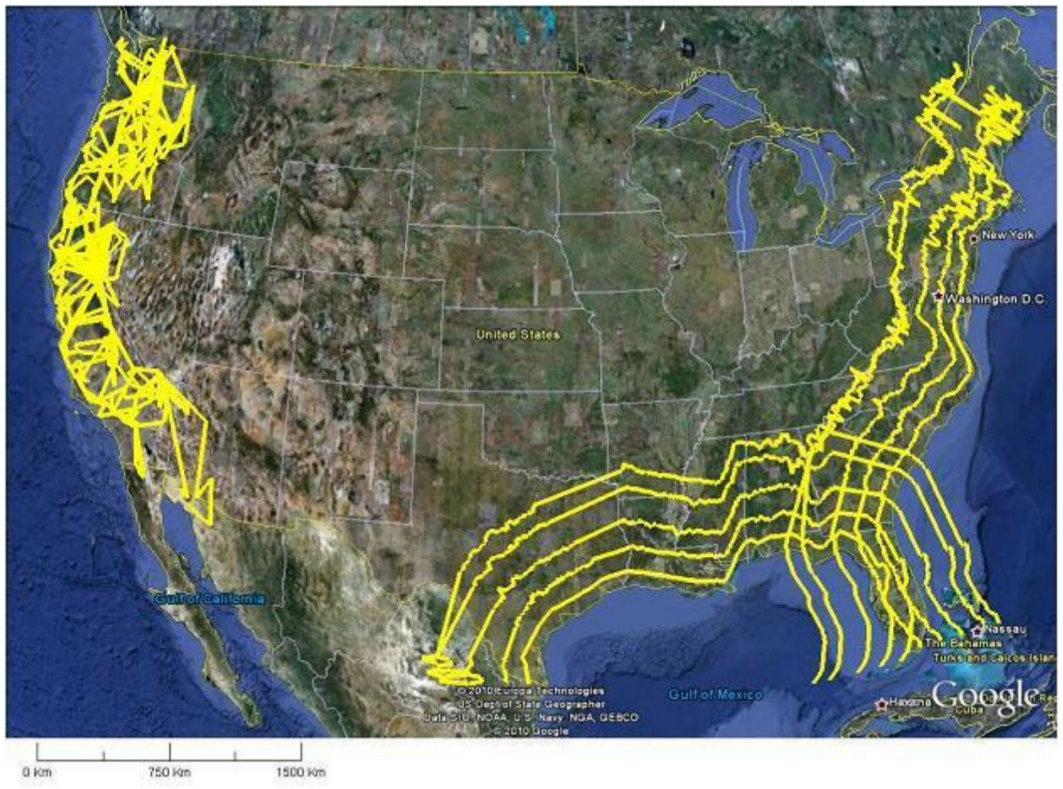



**Figure 5-3. Composite Depiction of Exclusion Zone Distances, Shipborne Radar Systems**



See U.S. Dep't of Commerce, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands*, at 5-7 (Oct. 2010), https://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf.

# Census tract PALs create usage opportunities

- Smaller license areas open the auctions to additional potential users
  - Localized services (e.g., rural WISPs, M2M networks in factories, college campus networks)
  - Flexibility to acquire additional spectrum in specific areas where additional capacity is needed
- **GE:** *"There are industrial and critical infrastructure 5G deployments, like GE's, that will be highly specialized and limited to a narrow area . . . . Moving to PEAs would force GE and other providers off PALs and deprive them of the licensed spectrum necessary to support mission-critical applications."*
- **WISPA:** *"The notions of 'targeted' and 'localized' areas mean one thing to large mobile wireless carriers and quite something else to rural broadband providers, private networks, airports, campuses, shopping malls, electric grids, stadia and arenas, and a host of other use cases that do not divide the country into 416 geographic areas that are too large for their service needs and too expensive for their wallets."*
- **Professor Paul Milgrom:** *"[L]ocal users with high value uses should be able to bid to supply their own needs, without being forced to bargain with a third party that controls their access. This factor favors licenses covering census tracts for this application."*



*See* Comments of Open Technology Institute at New America and Public Knowledge, GN Dkt. 12-354, et al., at 10 (filed July 24, 2017); Comments of the Wireless Internet Service Providers Association, GN Dkt. 12-354, et al., at 22 (filed July 25, 2017); *In the Matter of Use of Spectrum Bands Above 24 GHz Mobile Radio Services, et al.*, Notice of Proposed Rulemaking, 30 FCC Rcd. 11878, ¶ 111 (2015); Letter from Paul Milgrom, Professor, Stanford University, to Marlene H. Dortch, Secretary, FCC, GN Dkt. 12-354, ¶ 15 (filed Aug. 7, 2017); Reply Comments of the General Electric Company, GN Dkt. 12-354, et al., at 9, 12 (filed Aug. 8, 2017) .

# Modern systems can handle a large number of licenses

- Innovative and high-volume auctions are common
  - FCC has just completed the complex 600 MHz incentive auction
  - eBay has ~1 billion active listings at any given time
  - Google conducts millions of auctions every minute for its ads business
- SAS administrators and PAL licensees are capable of managing tract licensees
  - No SAS applicant views the existing license framework as beyond its capabilities
    - E.g., "CTIA's SAS will support both CBSD categories for GAA and Priority Access use, consistent with the rules adopted in the *3.5 GHz Order*, *3.5 GHz Second R&O*, and *3.5 GHz Reconsideration Order*, as applicable"
  - Sprint/Clearwire currently manages over 30,000 active FCC licenses



*See* Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 24-25 (filed July 24, 2017); Letter from Paul Anuszkiewicz, Vice President, Spectrum Planning, CTIA, to Marlene H. Dortch, Secretary, FCC, in GN Dkt. 15-319, at 6 (filed May 16, 2016); Letter from Paul Milgrom, Professor, Stanford University to Marlene H. Dortch, Secretary, FCC, in GN Dkt. 12-354, ¶ 6 (filed Aug. 7, 2017).

# There is no good reason to extend PAL terms

- Rule 96.27(b) specifies sequential licenses with a total term of **6 years** at the PAL licensee's option during the first application window (not 3 years as CTIA suggests)
- License terms should reflect that the most productive and valuable uses of the band could change over time; carriers until recently thought the band would not be useful for mobile

> *"This spectrum has limited value for traditional CMRS and mobile broadband transmissions[.]"*
>
> *– AT&T (2013)*

> *"[T]his spectrum is not below 3 GHz and therefore is not suitable at this time for mobile broadband."*
>
> *– CTIA (2013)*

> *"[T]he spectral location of the 3550–3650 MHz [band makes it] less suitable for mobile broadband applications."*
>
> *– T-Mobile (2011)*

- Longer/renewable license terms lead to higher upfront costs that could exclude smaller participants from the auction and thus reduce auction proceeds

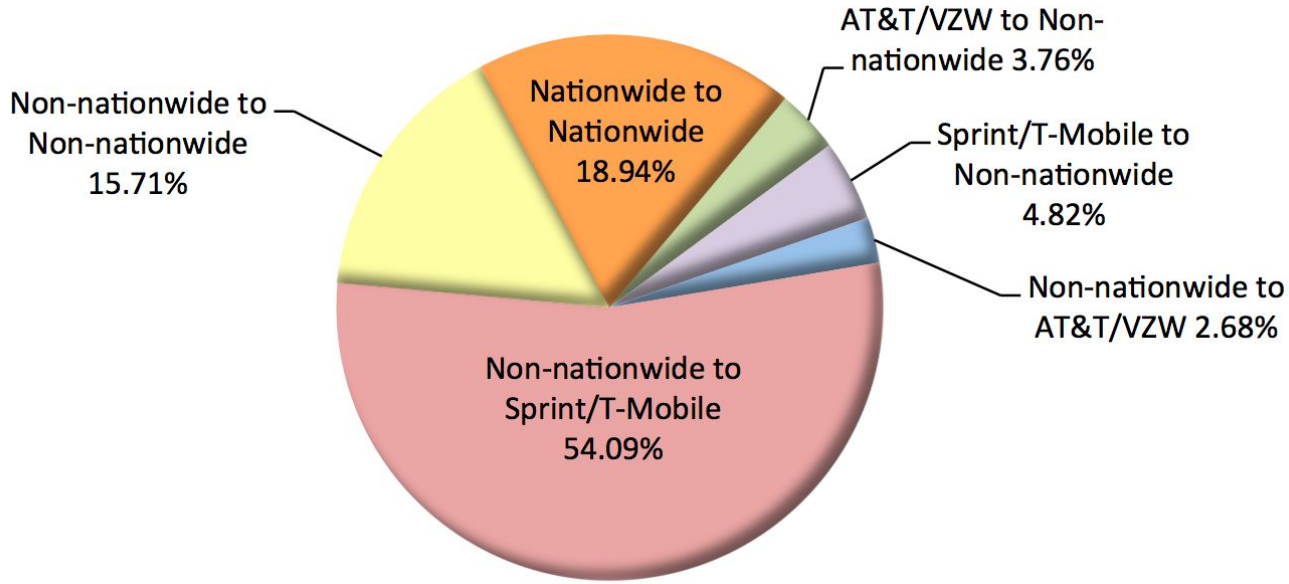


*See* Comments of AT&T, GN Dkt. 12-354, at *i* (filed Feb. 20, 2013); Comments of CTIA – The Wireless Association, GN Dkt. 12-354, at 1 (filed Feb. 20, 2013); Comments of Google Inc. and Alphabet Access, GN Dkt. 12-354, et al., at 18-19 (filed July 24, 2017); Comments of T-Mobile USA, Inc., ET Dkt. 10-123, at 7 (filed Apr. 22, 2011).

# Secondary markets won't fix exclusionary rules

- CBRS R&O, ¶100: "Divesting large, unwanted swaths through secondary markets transactions could impose significant transactions costs"
- National carriers have little incentive to support new entrants or disruptive technologies by making their spectrum available on the secondary market
- Spectrum leases historically have promoted consolidation instead of diversification

**MHz/POPs Leased, 2003-2010**






*See In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd. 3959, ¶ 100 (2015); Mobile Future, *FCC Spectrum Auctions and Secondary Market Policies: An Assessment of the Distribution of Spectrum Resources Under the Spectrum Screen*, at 19 (Nov. 2013), http://mobilefuture.org/wp-content/uploads/2013/11/Paper-Distribution-of-Spectrum-Resources.pdf.

# Industry Has Resolved Issues Relating to Confidential Information

# SAS providers & carriers have developed a mutually satisfactory legal agreement covering confidential data

- Model SAS-SAS agreement protects confidential information exchanged between administrators
  - Supported by AT&T, Comsearch, CTIA, Federated Wireless, Google, and Sprint
  - SAS recipient may not disclose confidential data (unless ordered by FCC/court), and may use the data only for frequency assignment and interference coordination
  - **CTIA:** "*[T]he agreement … provides the necessary protections for SAS customers' proprietary and competitively sensitive information, as well as end users' private information.*"
- Outside of SAS operations, some level of information regarding CBRS deployments will be visible, and beneficial to the public
  - Released by operators themselves (e.g., http://hotspots.wifi.comcast.com)
  - Collected by third-parties (e.g., opensignal.com)



*See* Letter from Brian M. Josef, Assistant Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Dkt. 15-319 (filed Sept. 29, 2016).